

Hazardous Wastes in Eastern and Central Europe: Technology and Health Effects

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Issues of hazardous waste management are major concerns in the countries of eastern and central Europe. A National Institute of Environmental Health Sciences-supported conference was held in Prague, Czech Republic, as a part of a continuing effort to provide information and promote discussion among the countries of eastern and central Europe on issues related to hazardous wastes. The focus was on incineration as a means of disposal of hazardous wastes, with discussions on both engineering methods for safe incineration, and possible human health effects from incineration by-products. Representatives from government agencies, academic institutions, and local industries from 14 countries in the region participated along with a few U.S. and western European experts in this field. A series of 12 country reports documented national issues relating to the environment, with a focus on use of incineration for hazardous waste disposal. A particularly valuable contribution was made by junior scientists from the region, who described results of environmental issues in their countries. *Key words:* arsenic, cadmium, dioxins, human health, incineration, lead, metals, PCBs, persistent organic pollutants, pesticides. *Environ Health Perspect* 107:249–250 (1999). [Online 19 February 1999] <http://ehpnet1.niehs.nih.gov/docs/1999/107p249-250carpenter/abstract.html>

Environmental pollution and degradation are serious public health problems in central and eastern Europe as a result of little attention devoted to the consequences of rapid industrialization during the communist years. More recently, as these nations move toward market economies, the conflicting interests of economic development in the face of inefficient and polluting industries compete for attention.

The human and environmental impacts of the potentially toxic emissions from remediation processes in the form of by-products continue to create regulatory attention and widespread public concerns. The challenge to industry to further reduce emissions of trace organics and heavy metals as regulatory standards become increasingly stringent and public opposition to incineration increases is formidable.

These problems are endemic across the region, but the type and sources of contamination vary by nation. Rapid industrialization without any real environmental or health regulatory controls has placed enormous pressure on these emerging countries to deal with cleaning up contamination at the same time that their economies have other priorities. The placement of meaningful and realistic controls is competing with other important areas of these newly emerging economies.

The type and sources of contamination vary by nation, as do the steps necessary to remediate and gain a better understanding of any potential health consequence resulting from the placement and use of either existing

or new environmental control/remediation technologies.

Central and eastern Europe have attained incredible potential since the fall of the Soviet Union. Many countries in the region have emerging market economies with steadily rising gross domestic products and falling inflation. For example, the Czech Republic has an unemployment rate of approximately 3–5%, and although there was severe flooding in 1997, Czech banks are in good shape to deal with its ramifications without a monetary problem emerging (1). Similarly, Poland is dealing effectively with the 1997 flooding (considered the worst natural disaster in centuries and causing billions of dollars in damages) both economically and from a public health perspective (2). Economic growth in Latvia was just under 3% in 1996 and inflation was the lowest in the Baltic states at 7.3%, while economic growth in Lithuania was 3.6% in 1996 and 7.6% in 1997 (3). Hungary recently received a World Bank loan of \$60 million to boost power supplies needed to meet electricity demands. Ukraine has teamed up with Romania and Moldova to form a free economic zone, increasing the potential for foreign capital and private investment. Bulgaria has been praised by the International Monetary Fund for its efforts in economic reform measures (4). On a more regional level, the European Union is to begin working with Hungary, Poland, the Czech Republic, Estonia, and Slovenia to improve and expand the transportation infrastructure through road construction (5). This

will greatly increase commerce, investment, and economic growth as the European Commission moves forward with a program to create 10 corridors from the Aegean Sea to the Baltic, and from the German border to Moscow. The European Bank for Reconstruction and Development estimates that the total infrastructure bill for eastern Europe is between \$200 and \$300 billion (5).

One goal of sound robust economies is to be able to prevent exposure and reduce risk of disease for their citizens. Preventing exposure will reduce risk and accordingly the cost to society—monetary, social, and psychological—will be reduced and the public's health will be improved. However, it is imperative to define what is entailed in preventing exposure, such that cost-effective decisions can be made based on an accurate estimation of risk. In addition, exposure assessment must be linked with an individual's genetic susceptibility to develop a more realistic prevention strategy.

The other component of reducing exposure, and therefore risk, is remediation. Ideally, remediation could be the first and only step of prevention: remediate, reduce exposure, prevent the risk. However, it is not conceivable to remediate everything and eliminate all possible exposures.

Remediation leads to prevention, which leads to both better public health and decreased costs. First and foremost, remediation, if done in an efficient and technically feasible manner, reduces the amount and toxicity of hazardous substances, thereby promoting better public health and minimization of disease, with decreased mortality and morbidity.

For a remediation strategy to play effectively into prevention, we must be able to

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identify and assess the risks so that we can determine what to remediate, and to what levels. In effect, this is the benefit of a multidisciplinary approach to research. As we are better able to identify the risk of an exposure and assess the risk on a population, we will be better able to develop an appropriate remediation strategy—one that takes public health into careful consideration.

As a continuation of National Institute of Environmental Health Sciences-supported efforts to participate in the debate of issues related to hazardous wastes in eastern and central Europe, a conference was held in Prague 16–19 November 1997 entitled “Remediation of Hazardous Wastes in Central and Eastern Europe: Technology and Health Effects.” More than 60 scientists from 18 countries, including 14 countries from the region, were in attendance. A central theme, chosen to reflect the previously expressed concerns from the region, was a focus on incineration as a method of treatment of hazardous wastes. Although many countries in the region are moving rapidly toward incineration of both municipal and hazardous wastes, there is often lack of expertise on technologies that reduce toxic releases from incinerator stacks, and a lack of information on the specific health effects of concern from these releases. Thus the discussion focused both on the engineering aspects of incineration and the health effects posed by release of metals, chlorinated hydrocarbons, and other products, and on methods of risk reduction and risk assessment. Country reports were presented by scientists from Armenia, Azerbaijan, Belarus, the Czech Republic, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Russia, and Ukraine. These reports described some aspect of hazardous waste management and/or health effects of particular concern in the individual country. A major portion of the meeting was devoted to poster presentations by junior and senior

scientists from the region on subjects ranging from engineering to medicine. The overall intent was to provide a forum for multidisciplinary interactions between scientists and engineers whose research activities are focused on topics that include remediation design and operation, mechanisms of formation of remediation-derived by-products, hazard and risk assessment of remediation by-products, and human health effects of organic and inorganic remediation products. The full proceedings of this meeting have been published (6).

Keynote presentations discussed the fact that with hazardous wastes there is the potential for human exposure, that there is a limited database in this region, and that there are strong arguments in favor of preventive measures. The latter point is particularly important in that it highlights research issues that are crucial to exposure assessment and that need to be linked more closely with individual susceptibility. Key to assessment of exposure are those issues surrounding bioavailability of hazardous substances. Specifically, it is important to assess transport, persistence, and bioaccumulation, although the point is that these are all interrelated. Therefore, by developing and using efficient and technologically relevant remediation measures, exposure and risk can be reduced. In this regard remediation is a form of public health intervention.

This premise is a critical one. It is imperative that health investigators, public health officials, and biomedical researchers work more closely with engineers if the complexity of the hazardous waste problem can ever be dealt with. Remediation must fit into a public health paradigm. There should be more of an emphasis placed on biodegradation/bioremediation in central and eastern Europe, less from a “green” initiative than from a health and engineering perspective. Biodegradation/bioremediation is a likely possibility for common

ground between these two broad disciplines. Furthermore, there needs to be better understanding of the economics of consequences of environmental exposures coupled with the anthropological (social and cultural) significance of such exposures, specifically in two broad areas—in relationship to environmental exposure and in relationship to health. This set of interdisciplinary initiatives would better enable culturally relevant prevention/intervention activities in those under-served populations adversely impacted by an environmental contaminant. This would strengthen the participation of affected communities in this effort. Community based prevention/intervention research in central and eastern Europe would expand the knowledge and understanding of the potential causes and remedies of environmentally related disorders, while at the same time enhancing the capacity of communities to participate in the processes that shape research approaches and intervention strategies. Given the complexity and magnitude of environmental health problems, research endeavors aimed at improving our knowledge of and ability to resolve these issues can benefit from establishing collaborative relationships with the communities experiencing these problems.

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